



# Cyclone vulnerability and coping strategies of coastal community: village level assessment in Bangladesh

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One of the most devastating climatic hazard 'cyclone' hit coastal zone of Bangladesh more or less every two to three years; damaging physical infrastructure, loss of life and livelihood, property damage, disruption of social system, economy loss. Nisanbaria union of Taltoliupazila under Barguna district is adjacent to Bay of Bengal that's why during any kind of depression into the sea will hit this coastal area in a medium or large scale. This study focuses on assessment of cyclone vulnerability by analyzing community present situation and to assess the coping strategies by analyzing their past experience. For conducting this research both primary and secondary data are collected to fulfil the objectives. Factors that increase the vulnerability of local community includes location, economic condition, house pattern, lack of road connectivity, insufficient cyclone shelter, dependency ratio, lack of awareness etc. The coping strategies includes taking shelter in safe place, livelihood diversification, using indigenous knowledge in cyclone warning, getting relief from local GOs and NGOs etc. The GOs and NGOs should take action for reducing the vulnerability like construction of new cyclone shelter, improved road connectivity, construction of embankment, giving priority of peoples indigenous practice, raising awareness of local community to cope with the cyclone.

## INTRODUCTION

Disaster is very common in Bangladesh due to its geographical location and socio-economic conditions (Kabir, 2014; Hasan, 2008). During the last 100 years, Bangladesh has experienced 53 major cyclones (Ahamed & Faisal, 2012). Basically, on average, Bangladesh specially the coastal area faces one severe cyclone in every three years (Kabir, 2014). Tropical cyclones and storm not only have devastating impacts on the life and livelihood of the coastal habitants, but also cause a vast negative reaction on its national economic growth (Kamal, 2012; Jahan, 2012). Niekerk (2011) point out that political, economic, physical, social, and environmental compound or alleviate vulnerability. Islam (2010) points out that the social, economic, cultural and political contexts of Bangladesh's women make them overall more vulnerable to climate change. Early warning systems is important for cyclone mitigation but it is also find out that sometimes vulnerable communities do not receive an early warning due a lack of partnerships and transportation (Malone, 2009). Bangladesh Meteorological Department relies on information from external, international weather forecasting stations, specifically

Japan's meteorological information (Bisson, 2012).

In disaster management, coping strategies can be defined as a set of activities or mechanism by which people try to survive in disasters, recover their situation and develop their conditions after disaster (UNISDR, 2009). People of Bangladesh have long history to cope with natural disasters. The people of the country passively react to cyclone hazards before the event; nonetheless, during and after the cyclone through individual initiatives, kinship ties and obligations, social networking, borrowing, taking shelter along an embankment, searching for alternative sources of income reducing expenditure and selling assets. (Alam and Collins, 2009; DelNinno et al. 2001; Kamal, 2012 and Hasan, 2008).

Barguna is one of the most vulnerable districts to cyclone in the country. The past record shows that every cyclone that passed through Bangladesh must hit Barguna district. Among the upazila of Barguna district, TaltoliUpazila (Nisanbaria Union) is most vulnerable to cyclone hazard as it is adjacent with 3 main rivers (Payra, Bwrishwar and Bishkhali). The intensity and frequency of cyclone is higher in this union. The people of this union have no clear idea why such cyclones occur again and again. Some people think it happens as "the wish of God", while others have no explanations for such extreme events. The present study is conducted to know how Nisanbaria union's people coped with and recovered their livelihood in response to a tropical cyclone so that it can be helpful for further research on this issue.

The objectives of the study are as follows:

- To find out the factors that makes people vulnerable to cyclone by analyzing present situation

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- To find out the coping strategies of local people to cyclone by understanding their past experience in the study area

## RESULTS AND DISCUSSION

### Respondent Profile

The overall proportion of the younger age groups is substantially larger than that of older age groups for each sex. The average age structures of the respondents are 1-14 years (29.05%), 15-30 years (31.84%), 31-45 years (25.13%), 46 years or above (19.96%) respectively. Most of the respondents are Muslim (83.33%) and Hindu (16.67%). The educational status of the respondents in this area is very poor. Among the respondent (30.72%), percent of the respondents never attended any school/madrassa/formal educational institute (44.69%) complete only class 1-5, (20.67%) has complete class 6-10 and only (3.91%) respondent complete class 11 or more.

### Factor that Causes Vulnerability

#### Structural Vulnerability

##### Vulnerability Due to Pattern and Location of House

The location and pattern of house are the most important factors determining people's vulnerability to a cyclone. Study found that most of the house in this area consists of hut, bamboo, kacha, semi pucca etc. (46.67% house is kacha, 11.11% house is semi pucca, 22.22% house is hut and 20% house is jhupri). Previous experience shows that this type of house faced more wind speeds and devastated within a few minutes. People living in kacha and Jhupri houses know that their houses are vulnerable to cyclone but due to socio-economic condition they cannot build cyclone resilient houses. On the other hand if the plinth height of house is high enough then the house owners are able to save family members and properties from strongest tidal surges. But in this area the height of the plinth is on an average two feet. As a result if cyclone occurs these types of house will go down under water.

##### Vulnerability Due to Lack of Proper Sanitation

Sanitary latrine is important for maintaining good health but in the study area most of the respondents do not use sanitary latrine. They usually use unhealthy open and hanging toilet. Figure 3 indicate that 28.89% people has ring slab toilet, 33.33% people has hanging toilet, and 37% people has no toilet. In some case it is found that several families use a common toilet as they use common toilet they suffer from various diseases.

##### Vulnerability Due to Lack of Natural Barrier (Tree) Around the House

Tree plays important role in protecting human lives and property by reducing the wind and water speed that directly hit during tidal surge. But unfortunately the study found that in most houses there is no tree around the home. As a result if cyclone occurs it will directly hit the house and will cause numerous damages. In some house it is found that people only plant rain tree, banana around the house which make people most vulnerable to cyclone. Because these type tree cannot resist wind speed. During cyclone they are broken down or blow away and cause numerous impacts on people.

##### Vulnerability Due to Lack of Pure Drinking Water

There is a significant correlation between the availability of pure drinking water and the types of diseases suffered by the respondents during and after cyclone. In the study area it is found that there are only 25 tube wells for 557 household as a result sometimes they are forced to

take contaminated pond water and suffer from various diseases during and after cyclone. Sources of drinking water are shown in (Figure 4). The (Figure 4) revealed that drinking water is available for only 37.50 percent respondents 38.63 percent respondents notice that they get a little amount of pure drinking water, and 23.87 percent respondents indicate that drinking water is not available at cyclonic period.

##### Vulnerability Due to Lack of Transportation Infrastructure

We know that cyclonic hazard is coupled with severe wind and rain. However, most of the roads in the study area are made of earth. During the rainy season or cyclonic period, these pathways are damaged or destroyed. As the communication system is poor so the people are not willing to go to shelter.

##### Vulnerability Due to Lack of Land Use Plan

In Nisanbaria union the land use plan is poor. A significant number of people reported that they have no knowledge about land use plan. It is found that once rice production declined, then farmers shift to salt farming. As a result for short time they gain profits but it has no sustainability and has long-term environmental impact. Sometimes it may cause permanent loss of a valuable land.

##### Vulnerability Due to Lack of Access to Electricity

The people of the study area have very less access to televisions, radios and internet at their houses due to lack of electricity; so that they are unable to get information about upcoming disaster. Although Bangladesh government has improved early warning system to natural disasters in recent days, it is still ineffective because of lack of electricity.

##### Nonstructural Vulnerability in the Study Area

##### Vulnerability Due to Household Economic Condition

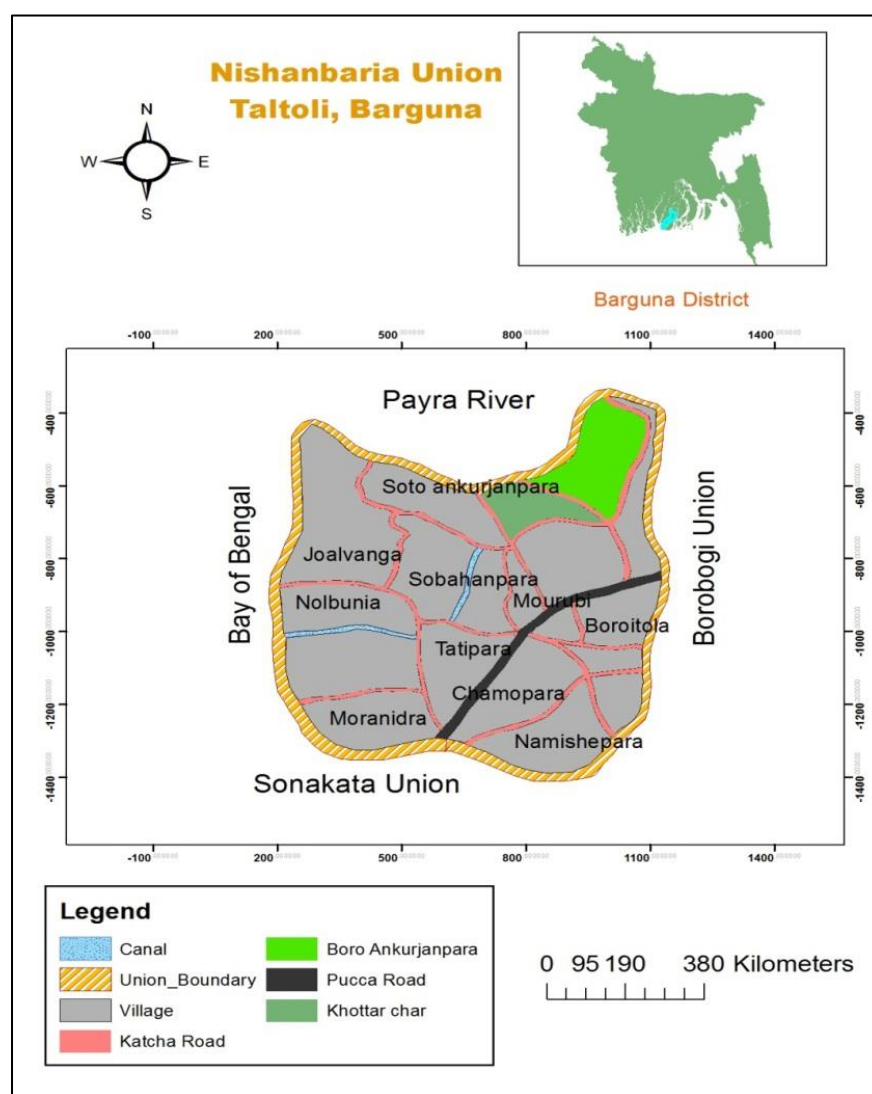
The people of the study area are very poor. The (Figure 5) shows that 35.55% people are always in needy condition, 44.44% people are in temporary needy condition, 13.33% are in income- expenditure equal condition, and only 6.67% people are rich. Only a few people can save something from their monthly income which is very limited. In emergency situation as they have no savings their family have to continue the day with starvation. Sometime they are unable to take proper treatment due to lack of money.

##### Vulnerability Due to Timing of Take Place in the Shelter

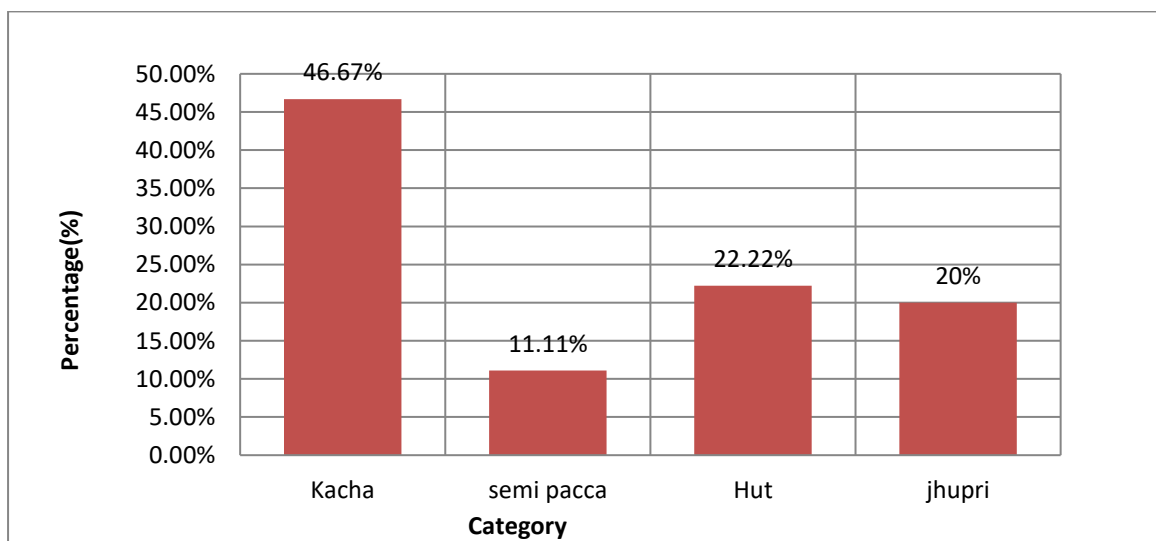
The primary school, high school, Caritas, and Heed Bangladesh office are mainly used as cyclone shelter in this area. The distance of this shelter is more than one kilometer from the village. As the shelters are far away from the village the people are not willing to go to this shelter. The timing of taking place in the shelter are shown in (Figure 6). The Figure 6 indicates that in the study area 41.45% people are not willing to go to the shelter. They stay in their home. 16.24% go to shelter when anybody injured or died in their family or neighbor's family. 26.22% people take shelter in safe place when their properties are fully or partially damaged. 11% people go to shelter when the cyclone are very close to the door. And finally 4.98% people only go to shelter when panic spread.

##### Vulnerability Due to Late Responses to Warnings

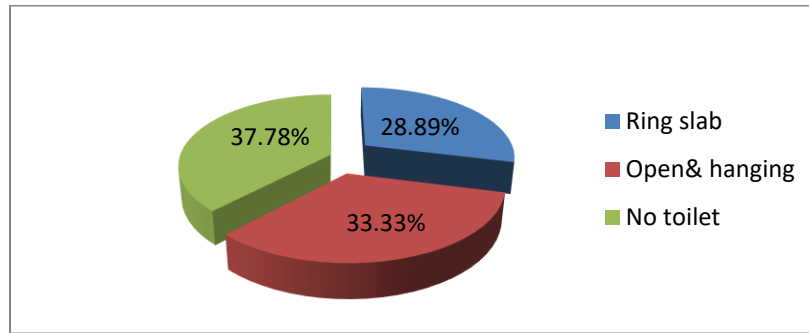
The people of this area are used to facing multiple hazards each year but they are not response to warning due time. The study found that, people start to prepare to save properties or decide to leave their homes for a



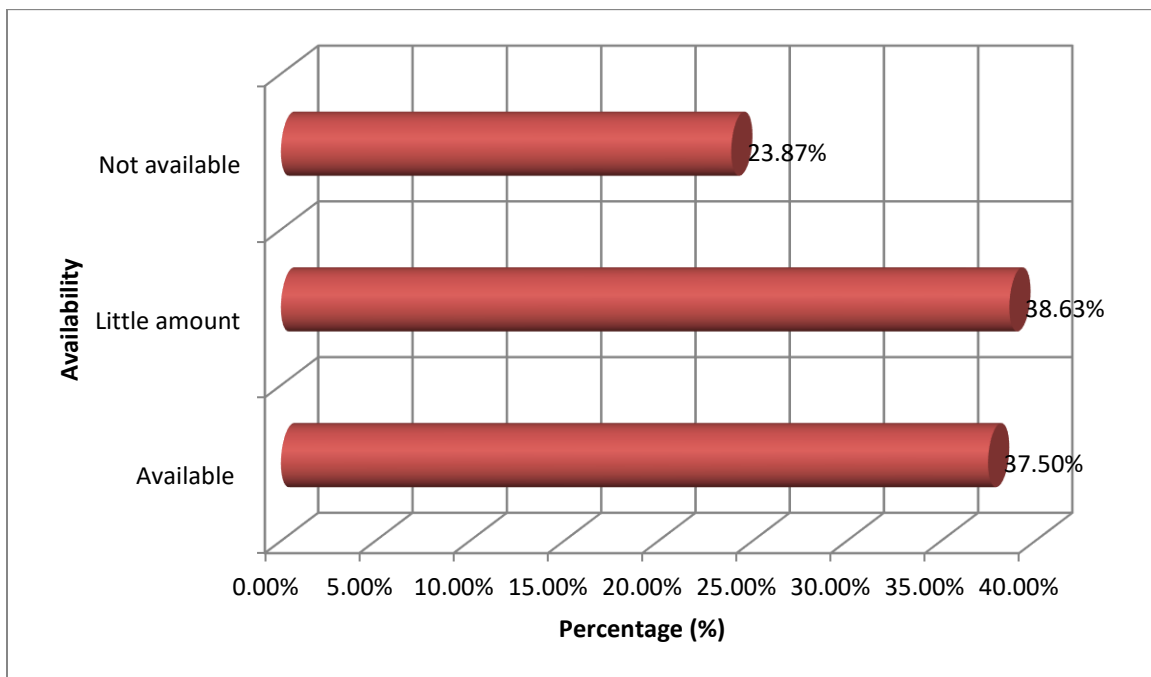
**Figure 1** Map of the study area (Prepared by ArcGIS 10)



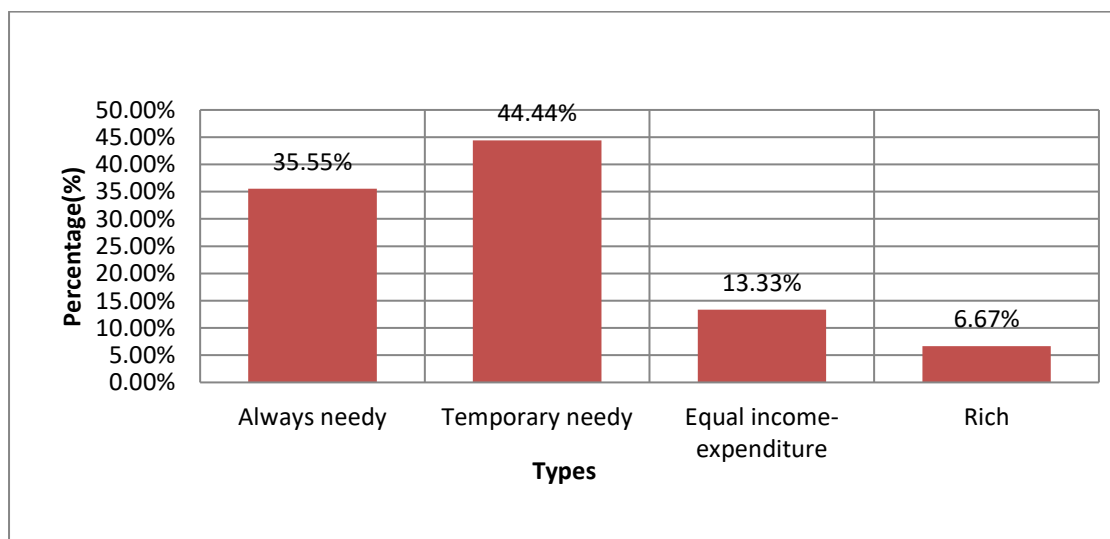
**Figure 2** Status of house pattern in the study area



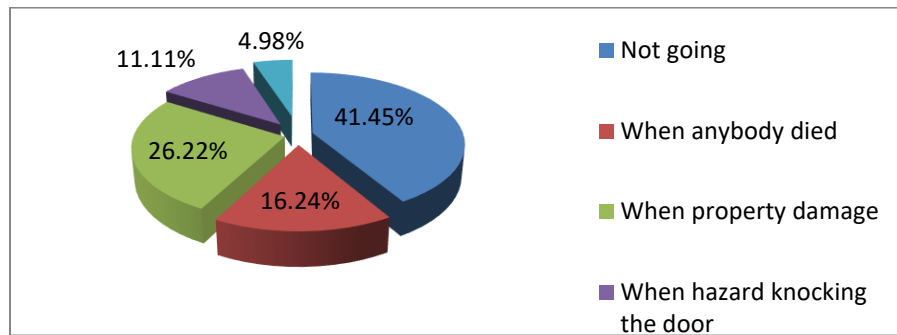
**Figure 3** Sanitation facility of the respondent



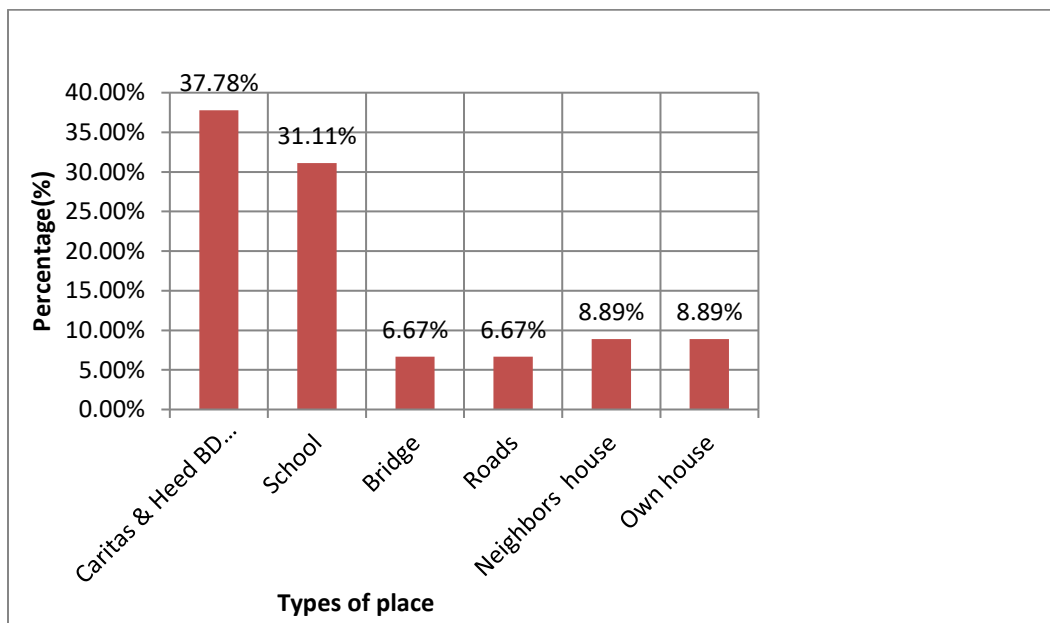
**Figure 4** Drinking water availability during and after cyclone



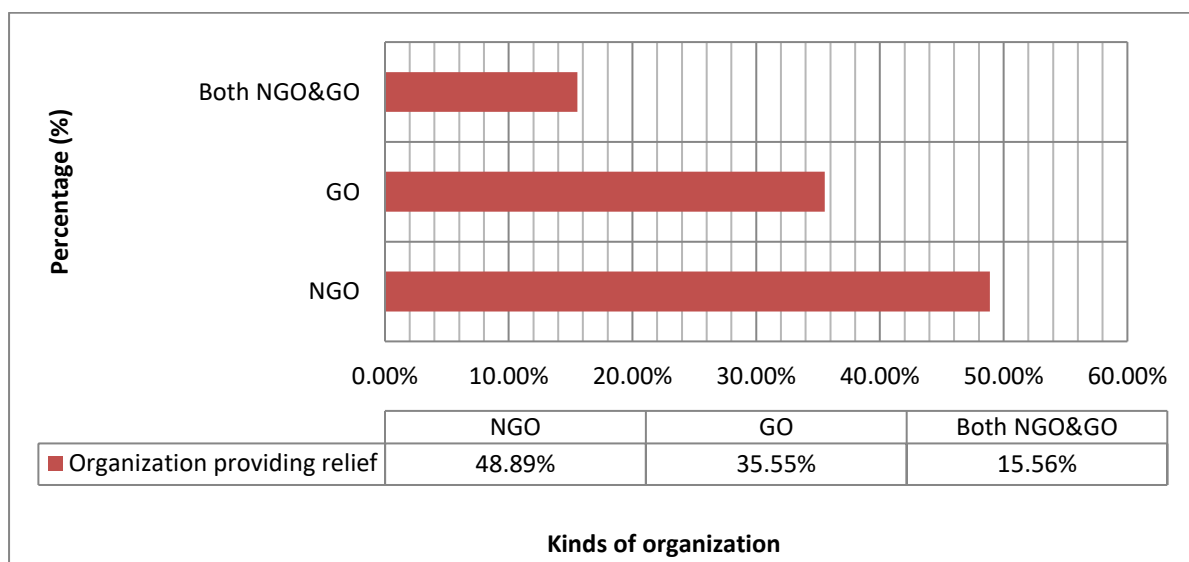
**Figure 5** Household economic status



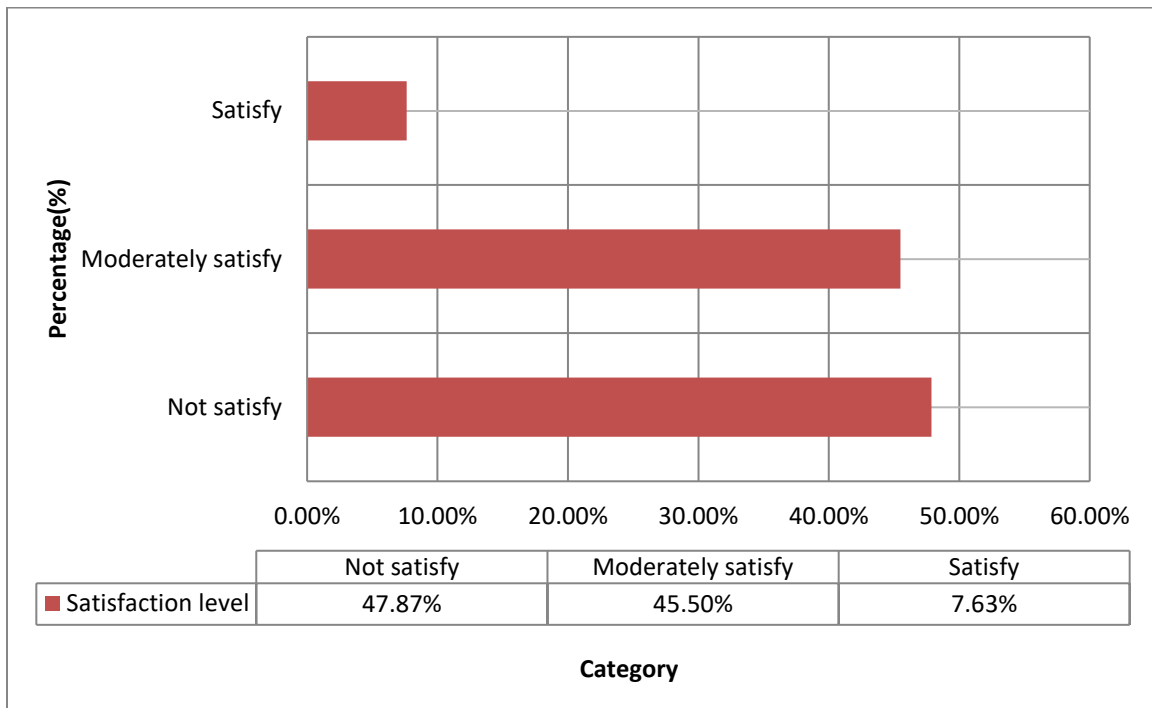
**Figure 2** Timing of taking place in the shelter



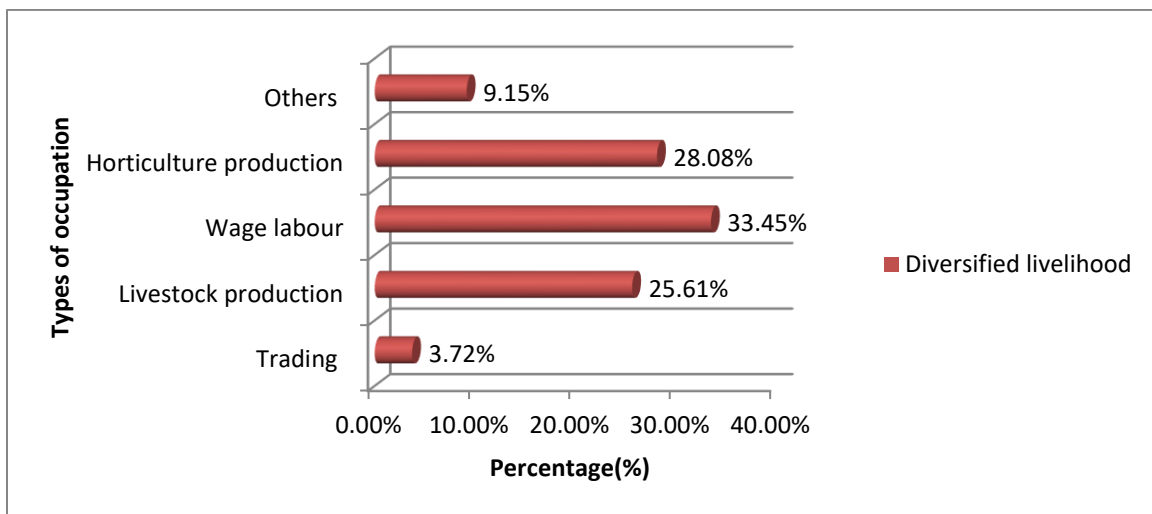
**Figure 7** Status of taking shelter in safe place



**Figure 8** Organization providing relief material



**Figure 9** Satisfaction level of the respondent



**Figure 10** Livelihood diversification

**Table 1** Indicator used to predict cyclone

Factor	Indicators
Weather pattern	Sky turns gloomy or overcast
	Black rolls of cloud
	Strong wind blows from south to east
River pattern	River water become hot
	Goroomgoroom sound in the river
Animal behavior	Ants with eggs in the mouth start climbing tree
	Cattle become restless and stop eating grass
	Fish jump in the river
	Frogs call constantly
Others	New leaves of tree fall to the ground
	Bending tree

cyclone shelter or other stronger buildings nearby after six to eight no signal on an average. Before that they wait and see whether the cyclone intensity is rising or not.

### ***Vulnerability Due to Complex Decision-Making Process***

People in this area cannot decide whether they will go to any shelter or other strong building after receiving signal. Most of the people only left their houses when they saw that the water is very close to their home. Sometimes family members have to wait for the arrival of the household head from outside. As the majority of inhabitants in this area are poor and have few assets to survive. They are not agree to go to shelter because they think that their property will be stolen in their absences. When the people decide to go then it is too late, because the wind and rainfall have increased sometimes they are not able to go to shelters.

### ***Vulnerability Due to Lack of Training and Public Awareness***

There is no provision for disaster preparedness training program for the people in this area. The training programs are arranged for the officials of different organizations and for the member of disaster management committees and volunteer committees. As a result, the local people are not able to develop their skill to cope with cyclone.

### ***Vulnerability Due to Female Members in Family***

Discussions with a female group indicated that the decision to leave home in most cases depend on male household head. Although among total number of the respondent 53.63% is male and 46.37% is female, in most case due to conservative religious beliefs, many of the male household's heads do not permit female member to move to cyclone shelters. They think that the female members of household might lose their purdah while travelling to or staying at cyclone shelters.

### ***Coping Strategy of Local People***

#### ***Going Safe Place during Cyclone***

Just earlier to the arrival of a cyclone surge, the people in this area are often trying to reach the shelters, higher places or other strong buildings. If those people not able to reach any shelters then they take shelter on rooftops during the water surge shown in (Figure 7). The (Figure 7) indicates that most of the respondents (37.78%) take shelter in Caritas& Heed Bangladesh office. 31.11% take shelter in the school 6.67% take shelter on the bridge. 6.67% take shelter on roads and 8.89% take shelter in neighbor's house. 8.89% respondents stay in their own residence during cyclone.

### ***Humanitarian Relief after Cyclone***

In the immediate aftermath of the cyclone relief interventions are initiated by different Government, NGOs and international humanitarian agencies. During survey it is found that all the households did not received relief to meet their basic needs. Only 57.87% people get relief material from different government and non-government organization. From the (Figure 8) we can see that 48.89% respondents receive relief from NGO and 35.55% get assistance from different government organization. However the poor households are not therefore satisfied with this relief provision. Because the relief operations were not well-coordinated sometimes it overlaps. Sometimes it is found that the people who are not affected get relief on the other hand victim are not get relief because of local politics. The satisfaction levels of the respondents shown in (Figure 8). The (Figure 9) show that 47.87% people are not satisfy with relief material they get after cyclone. 45.5% people are moderately satisfy with relief material and only 7.63% people are satisfy

with the relief goods provided by different national and international organization.

### ***Cooperation with each other***

The people in this area are very cordial. The study found that after receiving signal the local young community members play important role in saving the lives of people. The study found that during post cyclonic period the unaffected local people, offer assistance to affected people. In normal times, fishermen go fishing separately, but after a cyclone, they work as a group and share the same net and boat.

### ***Migration as a Coping Strategy***

Migration is generally considered an important livelihood strategy. The study indicate that in many cases the head of households migrated to large urban centers and sent remittances back home. In some cases entire households also migrated to make their living and returned later.

### ***Livelihood Diversification as Coping Strategy***

Generally people diversified their livelihood strategies into both on- and off-farm activities to cope with temporary crisis shown in (Figure 10). The (Figure 10) shows that among the respondent 3.72% diversified their livelihood into trading 25.61 % diversified their livelihood into livestock production, 33.45% diversified their livelihood into wage labor, 28.08% diversified their livelihood into horticulture production, and 9.15% diversified their livelihood into other activities. Thus diversifying their livelihood they survive with cyclone.

### ***Indigenous Knowledge about Disaster***

Due to lack of weather forecasting technologies like radio, TV and others. Most of the residents in this area depend on the indigenous technology for getting the signal of disaster. The indicators that are used for prediction of a cyclone are given in Table 1.

### ***Immediate Preparation towards Disaster***

After getting signal from BMD and indigenous early warning system the people in this area begin to take preparation. Some people hide their food; valuables and money in the earth. Some respondent send their valuable materials to their relatives in safer areas. The survey found that most of the respondent takes some dry food, drinking water, candle, first aid box with them when they take shelter in safe place.

### ***Learn from Previous Experience***

People living in the disaster-prone areas are very often affected by disaster. Following many generations of experience, people of the study village have learned to cope with cyclone in their own ways. Now a day's people raise the plinth height of their houses approximately 5 feet in order to save their seed and valuable property from tidewater during the monsoon season.

## **CONCLUSION**

Nisanbaria union of Taltoliupazila under Barguna district is one of the most vulnerable coastal areas to cyclone in the country. Most of the people are living below the poverty line; who live on daily wage labor, while others are engaged in agriculture, and fish cultivation. The people in the selected area do not have proper knowledge about cyclone. Further, they do not have adequate disaster preparedness at family and community levels. On the other hand the disaster management system in this area is very poor. This vulnerability exacerbated due to poor economic condition, poor communication system, lack of awareness, lack of cyclone shelter, inadequate land use plan, etc. The findings show



that the main coping strategies of people included fishing and collecting fish fry, loan from different NGO, livelihood diversification. Both national and international level the DRR activities should be reinforced.

## METHODOLOGY

### Location and Description of Study Area

This study has conducted in one administrative ward comprising 3 villages (Boro Ankurjan Para, Khottar Char and Bati Para) of Nisanbaria union in Taltoli Upazila of Barguna District. It lies between 22.129° North latitude between 90.2289° East latitude. The study area is bounded by Pyra River on north, Sonakata union on south, Barobogi canal on east and Bay of Bengal on west (Figure 1). The total area of study area is about 12 kilometers and population is 4500 where 2800 is male and 1700 is female. The total household is 457. The main occupation of this area is agriculture, fisheries small trader, wage labour, service holder and others. It consists of 7 mosques, 1 madrasa, and 2 primary schools (BBS, 2015).

### Data collection

To fulfill the objectives of this study, primary data and secondary data were collected from various sources. Primary data were collected through household survey (n=100), personal observation, site observation, Focus group discussion, Key Informant Interview (KII) and informal interviews. Secondary data were collected from various books, journals, different reports on cyclone vulnerability and capacity assessment, internet etc.

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